SAFETY BELT BUCKLE

The present invention relates to safety systems in motor vehicles, and, in particular, to passive safety devices, and more particularly, to a safety belt buckle designed to protect a driver and passengers in extreme situations.

A number of devices have been developed in the past and offer various solutions to the problems encountered with safety belt buckles. Examples of these innovations are described in the patents RU 2,101,202 and RU 2,125,396, Int. Cl.: A44B 11/00. The closest known background art is found in the utility model RU 15,841, Int. Cl.: A44B 11/00; B60R 22/30, published 20.11.2000, in which the buckle consists of interlocking receiving and inserted parts. The inserted part of the buckle includes the tongue having an opening at the tip of the tongue adapted to be received in the receiving part, and the receiving part, enclosed in protective housing, comprises U-shaped frame. The front part of the frame provides two symmetrically "bent-inwards" and facing each other portions of side walls of the frame. The frame also encloses the latch having recesses in side walls for supporting the blocking device, where the latch provides the tooth mounted on the front part of the latch for engagement in the opening of the tongue and the opening provided in the base of the frame. The lower part of the latch includes symmetrically protruding end portions loosely moveable in apertures located in sidewalls of the frame. The blocking device for blocking the latch is moveable within oblong apertures of side walls of the frame in the direction parallel to itself and to the base of the frame, where the blocking device controlled by the release button includes the spring which acts on the blocking device and has a shape of symmetrically bent plate whose bent portions are located in the lower bases of oblong apertures of side walls of the frame, the said plate comprising a central portion having the protruding flange to contact with side walls of the frame and flank parts with end portions to be in contact with the blocking device. Additionally, the buckle assembly includes the pusher with a pusher spring for pushing the tongue from the buckle. The lower bases of the oblong apertures in side walls of the frame are right-angled. The protruding flange of the central part of the spring is directed toward the protective housing of the receiving part of the buckle, where the central part of the spring and its protruding flange being located in the same plane.

The disadvantage of that construction can be seen in some problems relating to unlocking the buckle. It can be briefly described as follows. The intrusion of dust, dirt and debris into the buckle mechanism, corroded details, or, similarly, fatigue or breakdown of the pusher spring can increase friction strength and prevent the withdrawal of the tooth from openings in the tongue and in the base of the frame accordingly. Consequently, the force applied to unlock the buckle can become insufficient for unlocking. Accordingly, it is not excluded that, at some time, the release button, being depressed, would not unlock the buckle even if the blocking device has not prevented the tooth from withdrawal out of the tongue's opening any more.

Thus, it is believed that the described construction is deficient and unreliable in operation, and, consequently, not suitable for the use in extreme situations, which feature drastically reduces the field of application of the construction.

The object of the present invention is to substantially increase reliability of the safety belt buckle by means of providing the forced unlocking.

This object is achieved with the safety belt buckle comprising interlocking receiving and inserted parts, where the inserted part includes the tongue having the opening in the inserted end, the receiving part is enclosed in the protective housing and comprises U-shaped frame, the front part of which provides two symmetrically "bent-outwards" and facing each other portions of the flank walls of the frame, the frame includes the latch formed as a bent plate and comprising recesses at its side walls for supporting the blocking device, the front side of the latch includes the tooth arranged to interact with the opening in the tongue and with the opening in the base of the frame, the back side of the latch provides the lateral symmetrical longitudinal projections loosely arranged in the slots, located in the sidewalls of the frame, the blocking device for blocking the latch, which blocking device arranged to move within the oblong apertures provided in the side walls of the frame in a direction parallel both to itself and the base of the frame, the release button having slots for capturing the blocking device, the pusher with the pusher spring to interact with the tongue of the buckle, the spring of the blocking device to act on the said blocking device, and the anchoring element for securing the buckle to the body of the motor vehicle.

According to a preferred embodiment of the present invention, the latch comprises

additionally two supports for the blocking device, which supports are so arranged by one of the sides of recesses of the latch that the supports for the blocking device and the front edge of recesses of side walls of the latch define a gap in between them. The height of the supports for the blocking device on side walls of the latch is equal or exceeds the value of the depth of the recesses. The supports for the blocking device can make an acute angle with a longitudinal axis of the latch.

Further, one can find a detailed description of the present invention which is illustrated in accompanying drawings in which:

Fig. 1 is a full view of the buckle in a disassembled position;

Fig. 2 is a side cross section view of the buckle in a disengaged position;

Fig. 3 is a top cross section view of the buckle in a disengaged position;

Fig. 4 is a side cross section view of the buckle in a disengaged position with the latch;

Fig. 5 is a side cross section view of the buckle in the engaged position with the latch;

Fig. 6 is a top view of the buckle in the locked position;

Fig. 7 is a full view of the latch;

Fig. 8 is a plan view of supports for the blocking device located in the latch

The buckle for a safety belt in motor vehicles comprises interlocking receiving and inserted parts. The inserted part of the buckle includes the tongue 1 with an opening 2 at the tip of the tongue 1 adapted to be received in the receiving part. The receiving part comprises U-shaped frame 3 having the latch 4. The spring 5 of the blocking device 6 acts on the latch 4.The buckle assembly provides spring loaded pusher 8 with pusher spring 7 controlled by the release button 9 for pushing the tongue 1 out of the buckle. The front part of the frame 3 comprises bent-inwards elements 10 and 11 arranged symmetrically to flank walls 12 and 13 of the frame. The bent-inwards elements 10 and 11 face each other defining a gap between them. The flank walls 12 and 13 of the frame 3 comprise oblong apertures 14 for engaging the ends of the blocking device 6 and slots 15 adapted for receiving the lateral symmetrical longitudinal projections 16 of the latch 4. The base 17 of the frame 3 provides an opening 18 for the tooth 20 of the latch 4. The L- or U-shaped latch 4 is made of sheet steel in such a manner that the front side of the latch 4 comprises the tooth 20 which, being in locked position, is received within the opening 2 of the tongue 1 and within the opening 18 in the base 17 of the frame 3. The shape of the latch is arranged to enclose spring 5 of the blocking device 6 and its securing

elements. The front part of the latch 4 includes two symmetrical walls 21 having recesses 22 for supports 23 of the blocking device. The base 17 of the frame 3 comprises a pusher 8 with pusher spring 7 moveable along the axis of the frame 3. The pusher spring 7 is so arranged in the opening 18 of the base 17 of the frame 3 that one end of it bears against finger 26 of pusher 8 while other end bears against protruding element 27 of the base 17 of frame 3. The blocking device 6 blocks the latch 4 in the engaged position. To block the latch, the blocking device 6 spring loaded by the spring 5 moves longitudinally and parallel to the base 17 and is guided by oblong apertures 14 in flank walls 12 and 13 of frame 3, the motion of the blocking device is controlled by release button 9. One end of spring 5 bears against a centering element 28 of the blocking device 6 to prevent accidental displacement of the spring 5 in the direction of walls 12 and 13 of the frame 3. The other end of spring 5 bears against the frame 3 and anchoring element 30 of the buckle through the support 29. The support 29 includes a guiding element 31 (e.g having an opening) for the spring 5 of the blocking device 6 and is so secured in the buckle that the displacement of its ends towards the direction of movement of the tongue 1 is prevented. The centering element 28 and guiding element 31 of the spring 5 are arranged to prevent the displacement of the spring 5 of the blocking device 6 towards flank sides of the frame 3 in case of deformation of the spring in operational mode of the buckle. The flank walls 32 of release button 9 provide slots 33 for engaging the ends of blocking device 6.

The support 29 may be shaped as a bent rafter bearing against the apertures in the flank walls 12 and 13 of frame 3 or, alternatively, as an anchoring element rigidly and laterally secured at the base 17 of the frame 3 (e.g. riveted). Receiving part of the buckle is entirely enclosed in protective housing 34. The buckle for a seat belt is secured to a seat or a frame of a motor vehicle by means of the anchoring element 30.

The buckle as described above operates in the following manner. When in the locked position, the tooth 20 of the latch 4 is simultaneously received within the opening 2 of the tongue 1 and within the opening 18 of the base 17, where the blocking device 6 is pressed by the spring 5 against the oblong apertures 14 of the walls 12 and 13 in the direction of the tongue, so that spring 5 biases the blocking device to an upper edge 35 of side walls 21 of the latch 4. Thus, the tooth 20 of the latch 4 prevents the withdrawal of the tongue from the buckle and, at the same time, permanent pressure of the spring 5 against the latch 4 by the use of flank walls 12 and 13 provides a reliable engagement of

the tooth 20 within the opening 2 of the tongue 1 and within the opening 18 of the base 17. As any failure of the spring of the blocking device to operate properly may result in a spontaneous withdrawal of the tooth from the opening 2, the coil spring 5 of the blocking device is tightened prior to its usage in the assembly and arranged to have a low relative deformation.

Normally, to release the buckle, the release button 9 is depressed. The manually moveable release button 9 reaches the blocking device 6 and, overcoming the bias of the spring 5, forces the blocking device 6 to move within oblong apertures 14 toward the anchoring element 30 and to a distance enough to break its contact to the edges 35 of the latch. The latch 4 being under action of the biasing spring 7 of the pusher, rises as high as the depth "b" of the recess 22 of the latch, whereby the tooth 20 is removed from the opening 2 of the tongue 1 and the pusher 8 withdraws the tongue 1 from the buckle, thus releasing all buckle mechanism. Sometimes, in extreme situations or, alternatively, in case of weakening of the pusher's spring, it may occur that the latch would fail to reach the sufficient height to release the tongue from engagement with the tooth 20. By depressing the release button 9, the blocking device 6 is pressed against the supports 23, the said pressure provides additional power to the latch, thus forcing the latch to move toward the anchoring element and disengage the tongue from the tooth 20 of the latch 4. The above described can only be achieved by actuating the release button if a normal unlocking procedure is unable. The height labeled as "a" of supports 23 is defined by the depth "b" of recess 22 whereby the said height provides an operable engagement of the blocking device 6 with the supports and prevents the blocking device from sliding over the supports. When the latch is in the lifted position, the blocking device is guided to the gap 25 which is defined between the supports 23 and the front edge 24 of recesses 22 of side walls of the latch. By choosing the best suitable acute angle of arrival "γ" between supports 23 and longitudinal axis of the latch for any specified buckle mechanism, the optimum force for unlocking the latch of that specified buckle mechanism is achieved due to a contact of blocking device with the mentioned supports.

Accordingly, the present solution provides forced unlocking of the buckle by depressing the release button even if normal automatic unlocking under action of the force of spring has failed for some reason. The buckle can be always unlocked under action of the force applied to the release button.

Thus, taking into consideration the above description, the present solution is regarded as having substantially more reliable performance over already known solutions.